# DEVELOPMENT OF INSULIN RESISTANCE IN RATS AFTER LOW AMYLOSE VS HIGH AMYLOSE DIETS

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Dietary starch is a mixture of amylose, a straight chain molecule, and amylopectin which is highly branched. Starches with a low amylose content (ie. low ratio of amylose to amylopectin) are digested and absorbed more quickly than high amylose starches and produce higher post-prandial-glucose and insulin responses. We hypothesised that a diet based on low amylose starch would produce insulin resistance in the long term.

In the first study, Sprague-Dawley rats weighing 250 g were randomly assigned to receive either a low amylose or high amylose cornstarch diet as two meals/day (2 x 10 g) for 9 weeks. The diets were otherwise equivalent in energy (E), protein (22%E), fat (11%E), carbohydrate (69%E) and fibre. Mean body weights were not significantly different after 9 weeks of feeding. At this time the rats were cannulated and administered an in vivo glucose tolerance test (IVGTT) of 1g glucose/kg body weight. Plasma glucose and insulin levels were measured at 0, 2, 4, 6, 8, 10, 15 and 30 min.

Rats in the high amylose group showed a faster clearance of the glucose load. The $K_g$ (rate of glucose disappearance 10 min after infusion) of the rats fed the high amylose diet was significantly higher ($-2.44 \pm 0.9$, n=3) compared with the rats fed the low amylose diet ($-1.87 \pm 0.34$, n=4) . In addition, the insulin response to the IVGTT was two-fold higher in the rats fed the low amylose diet compared to the those fed the high amylose diet ($P<0.05$). The results suggested that the rats fed the low amylose diet became insulin resistant over the course of the study.

The aim of the second study was to confirm these findings in a second species of rat and to investigate the time course of emergence of the changes in glucose tolerance and/or insulin responses. Young weanling Wistar rats were randomly assigned to receive either a low amylose or high amylose cornstarch diet as two meals/day (2 x 10 g) for 12 weeks. After four, eight and 12 weeks of feeding, the rats were cannulated and administered an IVGTT of 1g glucose/kg body weight. The weanling rats showed a similar pattern of weight gain as the Sprague-Dawley rats, with a similar rates of weight gain after the first week of feeding. In contrast to the first study, there were no differences in glucose clearance between the two dietary groups at any time point. However, differences in the insulin response to the IVGTT began to emerge after eight weeks of feeding and by 12 weeks were two-fold higher in those fed the low amylose diet. Furthermore, basal plasma insulin concentration was two-fold higher in the rats fed the low amylose diet ($P<0.05$).

These results show that the nature of the carbohydrate in the diet can have significant effects on the development of insulin resistance in rats. If these results can be extrapolated to humans, there are important implications for the role of carbohydrate in the development of NIDDM.

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